City of Palmdale

Comparison and Summary of California High-Speed Rail Project Peer Reviews

Prepared by:

HLB Decision Economics Inc.

April 24, 2001

CALIFORNIA HIGH-SPEED RAIL PROJECT
CORRIDOR EVALUATION FINAL REPORT

Comparison and Summary of California High-Speed Rail Project Peer Reviews

Japan Railway Technical Services (JARTS)
French National Railway (SNCF)
DE-Consult

Prepared for the

City of Palmdale, California

Prepared By

HLB Decision Economics Inc.

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1. INTRODUCTION

In order to assist the California High-Speed Rail Authority (CHSRA, the "Authority") in the development of its high-speed rail program, three foreign peer review groups – namely, the Japan Railway Technical Service (JARTS), the French Railways (SNCF) and Deutsche Eisenbahn-Consulting (DE-Consult) (collectively the "Consultants") – were mandated by the Authority in the summer of 2000 to review the final report prepared by Parsons Brinkerhoff (PB).[1] Japan, France and Germany have long experience with high-speed rail service: the world's first high-speed train, the Japanese Shinkansen, was put in service in 1964, while the French and German railways have been operating high-speed trains–the "Train Grande Vitesse" (TGV) and the InterCity Express (ICE), respectively– since the 1980s.

Each peer review group was requested to comment on the Final Report based on its own judgment and experience. In addition, a list of 14 basic questions relating to design, construction costs, and operations issues was submitted to the three Consultants for specific comment. The questions submitted are as follows:

1. It is anticipated that trains will travel at maximum operating speeds near 220 mph (350 km/h). Is this a reasonable assumption for future versions of the ICE/TGV/Shinkansen?

   Our construction schedule assumes that the entire system would be operational by 2016, however segments may be operating by 2010. When is it expected that the operational speeds of the ICE/TGV/Shinkansen will exceed 200 mph (322 km/h). When are ICE/TGV/Shinkansen trains expected to operate at speeds of 220 mph (350 km/h)?

2. Are the acceleration and deceleration design speeds shown for "VHS" (Very High Speed) on Exhibit 2-6 consistent with those used for the ICE/TGV/Shinkansen?

3. Are the horizontal and vertical alignment criteria shown (Exhibits 2-7 and 2-8) for "VHS" consistent with those used for the ICE/TGV/Shinkansen?

4. What are the maximum gradients currently used for ICE/TGV/Shinkansen trains? Is it appropriate to design for maximum sustained gradients of 3.5% for ICE/TGV/Shinkansen trains? Can ICE/TGV/Shinkansen trains sustain gradients up to 5.0% or higher?

5. Are the clearances and right-of-way requirements assumed (Exhibits 2-9 and 2-10) consistent with those used for the ICE/TGV/Shinkansen?

6. Do the capital cost assumptions include all the appropriate elements used to construct ICE/TGV/Shinkansen lines?

[1] *California High-Speed Rail Corridor Evaluation, Final Report*, Parsons Brinkerhoff, December 30, 1999.

7. Is the basic operating plan similar to the types of different services run on ICE/TGV /Shinkansen lines?

   What sort of track configuration is needed to provide the ICE/TGV/Shinkansen's high-level of service (frequent service, express, skip-stop, and local services)?

   How many tracks are needed at stations (intermediate and terminus stations)?

8. What are the dwell times at ICE/TGV/Shinkansen stations?

   Does the ICE/TGV /Shinkansen include "schedule recovery time" when estimating trip times (see page II-17)?

9. What is the weight of the ICE/TGV/Shinkansen trainsets? Is it possible to run ICE/TGV /Shinkansen trainsets over the same tracks as conventional U.S. trains at reduced speeds? (See "Compatibility Issues" on pages II-19 – II-21. This issue will be important over the next few years.)

10. Are any freight services run over the ICE/TGV/Shinkansen lines? If yes, then what types of freight and how much? If no, why isn't freight run on ICE/TGV/Shinkansen lines?

    Are the assumptions made for potential freight services consistent with the design and maintenance of the ICE/TGV/Shinkansen (See "Potential Freight Service" pages II-22 and II-23)?

11. Is the Example Operating Scenario (page V-5) consistent with ICE/TGV/Shinkansen experience?

    What is the German/French/Japanese experience with commuters using the ICE/TGV /Shinkansen service?

    Do commuters use regular ICE/TGV/Shinkansen trains or do separate specialized commuter trains run for short distances on the ICE/TGV/Shinkansen lines?

12. How long does it typically take to plan and construct an ICE/TGV/Shinkansen line?

13. Are the typical sections in Appendix "A" consistent with ICE/TGV/Shinkansen design?

14. Based on ICE experience, do the unit costs listed in Appendix "B" seem appropriate?

This report is organized as follows: Section 2 addresses alignment and design issues (Questions 1, 2, 3, 4 and 5); Section 3 focuses on rolling stock and operation issues (Questions 7, 8, 9, 10 and 11); and Section 5 addresses cost analysis and schedule issues (Questions 6, 12, 13, 14). A summary of the three reviewers' conclusions is presented in Section 5.

2. ALIGNMENT AND DESIGN ISSUES

QUESTION 1: DESIGN SPEED

A maximum operational speed of 220 mph (350 km/h) is theoretically realistic, as most HSR lines planned for the near future in Europe and Asia (e.g., Korea and Taiwan) make similar assumptions. The technology is already available. The Japanese Shinkansen Series 500 train is capable of operating at 350 km/h. In 1990, the French TGV achieved a world record on rail at 515 km/h and has successfully exceeded 400 km/h on other tests since then.

The three Consultants stress several drawbacks of operating trains at 350 km/h, however, chiefly because of a higher level of noise and higher operating and maintenance costs. For instance, the SNCF points out that a TGV train running at 350 km/h consumes 30% more energy than if running at 320 km/h. TGV trains are not expected to operate at speeds of 350 km/h before 2010 as many issues (infrastructure maintenance, design of the rolling stock, integration in the environment, etc.) have still not been resolved. From the French point of view, it may be more reasonable to assume a speed below 350 km/h. In addition, environmental standards restrict the maximum speed of high-speed trains to 300 km/h in Japan and even 200 km/h in Germany as trains pass through highly populated urban areas.

QUESTION 2: ACCELERATION AND DECELERATION

The acceleration and deceleration rates shown for VHS on Exhibit 2-6 are globally consistent with TGV and Shinkansen. However, the comparison with ICE clearly shows that the values on Exhibit 2-6 are too high in the higher speed ranges (that is, from 200 km/h to 300 km/h and from 300 km/h to 350 km/h). According to DE-Consult, for the range 300-350 km/h, for example, the VHS value is shown as 1.0 km/h/s while the ICE 3 value is only 0.1 km/h/s. DE-Consult also comments that it is impossible to have the same acceleration rate (1.0 km/h/s) in the speed ranges 200-300 km/h and 300-350 km/h.

QUESTION 3: HORIZONTAL AND VERTICAL ALIGNMENT CRITERIA

The values used for the horizontal and vertical alignment criteria are consistent with those used in Japan. JARTS notes that those alignment criteria are highly dependent on the underlying level of technology. However, what is established today may be challenged and outdated ten years from now. No matter the technological innovations, horizontal and vertical alignment criteria should always be set in order to ensure the highest safety.

The SNCF agrees on the values quoted for vertical alignment but reckons that the recommended values of unbalanced superelevation for horizontal alignment are too high, especially with regard to safety standards, and recommends a 65 mm limit (instead of 128 mm) at 350 km/h for ballasted tracks. In the same way, DE-Consult recommends to lower the actual maximum superelevation for

ballasted tracks from 178 mm to 160 mm. The German regulation DS 800.0110 allows only 180 mm under exceptional conditions and only for slab tracks.

QUESTION 4: MAXIMUM GRADIENT

The three Consultants recommend a maximum gradient of 3.5% as most operational high-speed rail (HSR) systems in Europe and Asia have maximum gradients between 3.5% and 4%. For instance, the Shinkansen and TGV systems use a gradient limit of 3.5%. Though technically possible, a steep gradient of 5% is not recommended because it entails major drawbacks. Higher gradients affect braking performance (i.e., stopping distances increase) and reduce line global flow significantly, thus requiring operational speed restrictions. They also imply higher construction costs, as the use of heavy railway equipment and materials is difficult during the line construction (limitation of ballast train capacity, traction in multiple units, etc.).

According to SNCF, a maximum 4% gradient could be considered, provided that:

- The effects on the operating capacity are acceptable;
- The increase in the railway equipment construction costs is not substantial; and,
- The rolling stock is designed for this maximum gradient.

QUESTION 5: CLEARANCE AND RIGHT-OF-WAY

The horizontal and vertical gauges correspond exactly to French and German standards. The track centerline spacing and cross sections assumptions also are very similar to European standards. The track centerline spacing of 4.70 m for the California HSR system is regarded as a very safe assumption.

The net cross section above rail level of 90-100 m^2 for double-track tunnels in California is similar to cross-sections in Europe. DE-Consult points out that double track-tunnels are usually preferred to single-track tunnels because of lower construction costs. However, geological problems and safety considerations (seismic risk) may favor single-track tunnels.

The difference in rolling stock clearance and right-of-way for high-speed rail between Japan and Europe is that the car body width is slightly larger in Japan (3.4 m in Japan, 2.9 m in France and 3.1 m in Germany) while space for maintenance and wind pressure is larger in Europe (11.4 m in Japan, 13.6 m in France and 13.7 m in Germany).

3. ROLLING STOCK AND OPERATIONS ISSUES

QUESTION 7: BASIC OPERATING PLAN / STATION LAYOUT

Current operating plans in France are rather different from the one proposed in California. This is mainly due to the distribution of population: in France, the population is more concentrated in dense urban areas (for instance, the Paris metropolitan area accounts for 25% of the French population), separated by large zones of countryside. Therefore, few intermediate stops are required. This has a major consequence on the track configuration: most high-speed trains follow parallel paths, making an optimal use of the line capacity, skip-stop operations being reduced to the strict minimum.

DE-Consult points out that the type of turnout to be installed at the entrance and exit of a station shall provide the safest and most efficient operation of the line. However, it can have a substantial impact on the construction cost as well as the maintenance cost, especially if it is required to use low tangent ones.

JARTS states that to provide a high level of service, it is necessary to thoroughly examine not only the track configuration at each station but also the adequate location of rolling stock depots. As for passing tracks, it is not necessary to provide them at all the intermediate stations at the initial stage of the program when the traffic density is not high. Whether or not lead track is provided at terminal stations will have a large effect on the required number of arrival/departure tracks.

QUESTION 8: DWELL TIMES AND RECOVERY TIME

Dwell times are very similar in France and Germany: at TGV stations, the dwell time varies from 2 minutes to 7 minutes and averages 3.5 minutes approximately; at ICE stations the average dwell time is 2.7 minutes, with a maximum of 7 minutes and a minimum of 1 minute. In Japan, the dwell time is usually shorter, ranging form 45 seconds for new stations with fewer passengers to 2 minutes for the busiest stations. Therefore, the California dwell time assumption of 2 minutes is plausible. SNCF points out that as many intermediate stops are planned for the California HSR, dwell times must be as short as possible.

High-speed train trip times usually include a recovery time. The 6% schedule recovery time assumed for the California HSR system corresponds to the value applied to ICE and TGV trains. In Japan, the recovery time varies with the technology, from 9 minutes with a Series 700 train to 16 minutes with a Series 100 train.

QUESTION 9: TRAINSET WEIGHT AND RUN ON CONVENTIONAL RAIL

Trainset weights vary considerably among the three high-speed rail operations. Globally, the ICE trainset is slightly heavier than the TGV trainset. For instance, an ICE trainset of 200 meters has a weight of 455 tons while a TGV trainset of a similar length has a weight of 383 tons.

In France, TGV trains can run at a reduced speed on 5,700 km of conventional lines where conventional trains (commuter and freight) are operated. In Japan, the use of conventional tracks by Shinkansen trains, though possible, is exceptional as several problems arise regarding the high-speed train's operation diagram, power supply facilities and signaling. In Germany, commuter trains are operated on the conventional network only. However, there are several sections of the ICE network where travel times range from ½ hour to 1 hour, which is typical of commuter trips.

The use of conventional rail track by a high-speed train (HST) is an alternative that should be considered, despite its drawbacks in terms of technological complexity and costs, for it can yield substantial synergetic benefits (ridership). It requires, however, specific measures to deal with the respective systems and standards of the high-speed rail and conventional rail for common-use rolling stock, a reexamination of the rolling stock and other facilities of conventional rail and the coordination and linking of HSR and conventional rail.

The present situation in California, in particular the existing conventional railroad system, strongly supports the use of HST technology.

QUESTION 10: FREIGHT SERVICE

In Japan, the Shinkansen system is not built for freight, as the demand for high-speed rail freight service is very low. Almost all high-speed freight transport occurs either by expressway or airplane.

In Europe, there are two different design concepts for HSR: one is designed for passenger traffic only while the other is for mixed operation of passenger and freight trains. The TGV system is based on the first concept; it was built to standards that do not allow ordinary freight trains to run the line, as allowing for freight trains would increase construction costs, O&M costs and maintenance time significantly. However, in practice, a few TGV freight trains have been allowed on specific segments (Paris-Lyon and Paris-Bordeaux) under certain conditions (during the night, at a maximum speed of 200 km/h for safety reasons). The TGV postal train has been operated since the early 1980s.

The ICE system is representative of the second HSR concept. Because of the speed difference between freight trains and high-speed trains, freight trains must be operated at night, as is the case in France. The newer Spanish and Italian high-speed lines are also designed for mixed operation of passenger and freight trains.

According to JARTS, heavy freight is not suitable for high-speed rail in California. Given the well-developed road network in California, demand for freight transport is likely to be low in comparison to the necessary investment. DE-Consult also points out that in case of integration of the HSR system

with the existing railroad network, an exemption of the FRA regulations (regarding buff strength in particular) seems necessary.

QUESTION 11: EXAMPLE OF COMMUTER OPERATING SCENARIO

JARTS stresses the importance of including commuter transport in the "Example Operating Scenario." Shinkansen trains are used for commuter purposes in order to increase the utilization rate of the rolling stock.

The French TGV lines were not originally built to satisfy commuter demand. Usually, these lines offer few intermediate stations, and skip-stop operations are not normally scheduled (see answer to Question 7). However, in practice, some customers commute using the TGV, especially on the final segments to Paris (Dijon-Paris, Lille-Paris, Tours-Paris) where the total trip time is one hour or less.

The crucial issue facing the CHSRA is therefore how to satisfy all the demand and offer a high quality of service (short trip times and high frequency) at the same time.

4. COST ANALYSIS AND SCHEDULE ISSUES

QUESTION 6: ELEMENTS OF CAPITAL COSTS

Though the cost analysis seems rather complete, some items have not yet been adequately considered, according to DE-Consult:

- Costs for temporary site facilities (usually estimated as a percentage surcharge of 6-10% on the construction total);
- Safety and emergency rescue concepts for tunnels;
- Substructure (sub-ballast and frost proofing) and drainage.

DE-Consult stresses that the Corridor Evaluation Report does not make the distinction between temporary and permanent relocation of existing railroads. A temporary relocation includes the construction of a new temporary track, dismantling of existing track, restoration of the old track and dismantling of the temporary track; on the other hand, a permanent relocation encompasses construction of a new track and dismantling of the existing track. Both options should be considered and their relative cost assessed and compared. Utility relocation cost estimates seem too low for suburban and undeveloped areas.

The SNCF points out that the "Owner and Project Engineer" cost estimate for the California HSR system accounts for a larger proportion of total cost than for the TGV system. This may be due to the fact that the French HST is passing through highly populated areas.

QUESTION 12: PLANNING AND CONSTRUCTION PERIOD

SNCF, based on the experience of its four existing TGV lines, estimates that only 10 to 11 years are necessary for the construction of a high-speed line of approximately 300 km. In Germany, the construction of the new Cologne-Frankfurt line (200 km) took less than 6 years.

According to JARTS, the deciding factor for whether or not a construction schedule can be kept is the acquisition of land. DE-Consult also insists on the fact that the total duration of construction depends heavily on the respective logistics and organizational planning.

QUESTION 13: TYPICAL SECTIONS

Typical sections of the California HSR are adequate with respect to German standards but they differ on several aspects from French standards: in France, the right-of-way is larger in case of an interceptor ditch on top of a cut and for fence locations. In rocky areas, stone traps could be necessary, thus increasing the right-of-way requirement.

JARTS points out that in an environment where it is possible to acquire the necessary right-of-way, it is crucial that space be secured for the purposes of maintenance and noise/vibration mitigation measures. However, this may not be possible in highly populated areas.

QUESTION 14: UNIT COSTS

On the estimation of unit costs, the point of view of SNCF is sometimes different from DE-Consult's. The JARTS did not answer this question.

For earthwork and related items, the assumed California unit cost estimates are lower than those experienced in France and Germany. For instance, the California earthwork unit price is about 30% lower than the German price. This does not mean that California unit costs are underestimated, since conditions are undoubtedly different in California. However, for some segments of the alignment, the SNCF points out that the unit price seems too low ($0.15 million per kilometer).

Both SNCF and DE-Consult express concerns that drainage costs are coupled directly with earthwork costs, as climatic and geological conditions vary considerably from San Francisco to San Diego. In the same way, French and German experts have found the California unit price for track and turnouts to be underestimated.

Signaling and communications costs estimates seem too high with respect to French estimates, but they are reasonable in comparison with German estimates. California unit costs for aerial structures (bridges) are considerably much less than comparable values for German lines, but they are consistent with French values.

5. CONCLUSION

Overall, the three Consultants agree that the California HSR project is a viable and desirable way to address the increasing congestion of intercity passenger traffic in California. They view the PB Final Report as a valuable milestone document in the ongoing development of the project. At this stage, despite some data inconsistencies, they believe that the information provided by the Authority is sufficient to assess alternative corridors.

The Consultants disagree on several technical aspects of the Corridor Evaluation, however, such as the right-of-way requirements and acceleration standards. They also stress the difficulty of comparing HSR systems generally, as implementation and operation of a high-speed rail system both depend heavily on local conditions such as topography, available technologies, environmental standards, etc.

The Consultants note that at least three important issues are not addressed in the Rail Corridor Evaluation Final Report:

- General technical descriptions of candidate technologies (VHS and Maglev);
- Funding approaches and issues (including public participation and education); and
- Creation or designation of an entity able to implement and operate the high-speed train.

Finally, based on their analysis, the Consultants make three main recommendations:

1. Draw better distinctions between main trunk lines and terminal or regional lines;
2. Clearly anticipate the staging of the project and make distinctions between the trunk line and the extensions; and
3. Corroborate the Authority's traffic forecast (prepared by Charles River Associates) with another independent study.

CALIFORNIA HIGH-SPEED TRAIN

Benefits, Costs, and Risks Associated With the Choice of Alignment Between Bakersfield and Sylmar

Summary Report: Findings and Conclusions

Prepared for the

City of Palmdale, California

Prepared by

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CALIFORNIA HIGH-SPEED TRAIN

Benefits, Costs, and Risks Associated With The Choice of Alignment Between Bakersfield and Sylmar

Summary Report: Findings and Conclusions

As with any major investment program, business planning for California's proposed high-speed rail system involves choices and risks. In making selections among many choices, an effective business plan must achieve two purposes: namely, it must maximize opportunities to achieve desired outcomes, and it must minimize risks of undesirable outcomes or of outright failure.

AT ISSUE: THE CHOICE OF ALIGNMENT

The selection of route (alignment) is central to the achievement of desired outcomes and to the management of business risk. The two principal alignment alternatives considered by the California High-Speed Rail Authority (the "Authority") for crossing the Tehachapi Mountains between Bakersfield and Los Angeles Union Station – the I-5 Grapevine[1] and the Antelope Valley[2] – differ principally in relation to (1) total length and associated travel time, (2) accessibility to travel markets (people and destinations), and (3) length and complexity of tunneling and associated cost and schedule risk.

With respect to length, the I-5 Grapevine alignment is some 33 to 37 miles shorter than the Antelope Valley alternatives and would, therefore, result in a 7 percent (10-12 minute) shorter non-stop travel time between San Francisco and Los Angeles. Alternatively, the Antelope Valley routing would bring high-speed rail service to 350,000 more residents and 150,000 jobs than the I-5 Grapevine option today, and to almost *700,000* more people (and *270,000* jobs) in the first year of operation in the 2015-20 period.

From a construction perspective, while the I-5 Grapevine option would, as stated, require 33-37 fewer total route-miles of construction than the Antelope Valley alignment, this advantage would come at the cost of up to 13 more route-miles of the costliest and riskiest type of civil

[1]Numbered Options 1/1A. California High-Speed Rail Authority, *High-Speed Train Alignments/Stations Screening Evaluation, Bakersfield to Los Angeles*, Summary Report, July 27, 2001.
[2]Numbered Options 2/2A, 3/3A, and 4/4A, *ibid.*

construction encountered on the entire project – tunneling – through a fault-riddled section of the Tehachapi Mountains.

SCOPE OF THE ANALYSIS

In preparing this analysis of the benefits, costs, and risks associated with the choice of alignment between Bakersfield and Sylmar, HLB Decision Economics was asked by the City of Palmdale to address two questions, each from a business planning perspective:

1. Which alignment offers the best prospects for maximizing ridership and revenue, transportation and economic integration, and economic viability; and

2. Which alignment carries the lowest risk of construction cost overrun and schedule delay?

FINDINGS AND CONCLUSIONS

We find that the Antelope Valley alignment (Options 2/2A, 3/3A, 4/4A) offers the superior, risk-adjusted choice for the California High-Speed Train Project based on answers to the two questions posed immediately above. This finding is supported by the results below.

Ridership and Revenue

It is well known to rail planners that assessing the trade-off between length and accessibility to users (number and location of stations) is key to selecting an alignment that will maximize ridership and fare revenue. Whereas a shorter and faster route will attract more passengers than a longer and slower one, a course plotted through heavily populated regions will attract more demand than one through lightly-populated or wilderness areas. Our analysis indicates that the additional ridership generated by the greater access to users (residents and employers) under the Antelope Valley option will more than offset the potential ridership advantage of a modestly shorter end-to-end journey time using along the I-5 Grapevine alignment. Over the initial project life-cycle period (2017 to 2050), we estimate that total cumulative ridership with the Antelope Valley alignment would exceed that generated by the I-5 Grapevine option by more than 3 percent.

The conclusion that passenger demand and fare revenue are both maximized under the Antelope Valley alternative stems from the nature of the potential time savings under the I-5 Grapevine option and from the nature of growth patterns in the regions served by the two alignment choices. Studies commissioned by the Authority assume that an average journey time from Los Angeles to San Francisco using the I-5 Grapevine alignment would be 2 hours and 30 minutes to 2 hours and 33 minutes. (The range reflects engineering uncertainty about tunnel gradients. See risk analysis, below.) The same journey using the Antelope Valley alternative would take, on average, an estimated 2 hours and 42 minutes.

However, while the saving in average travel time under the I-5 Grapevine option would be between 9 and 12 minutes, 1,400 travelers recently surveyed in southern California were found to be fully *two and a half times* more sensitive to variability (uncertainty) in travel time than to differences in average travel time.[3] The 9 to 12 minute saving in average travel time is less than five percent of the total San Francisco to Los Angeles journey time, actual running times of European high-speed rail trains regularly vary from scheduled times by 3 to 5 minutes. Thus, when average time savings and running time variability are combined, we conclude that the impact on ridership of the I-5 Grapevine's route length advantage is likely to be minimal.

The second factor driving higher ridership and revenue under the Antelope Valley option is the pattern of population and employment growth. Whereas the I-5 Grapevine alignment would traverse wilderness and lightly-populated rural areas exclusively, the Antelope Valley alignment would serve an established growth center for both population and industry. As a cost competitive area for both residential and industrial expansion, the Antelope Valley is projected to grow at a rate *three to four times* that of the California overall. Resident population in the Valley is expected to almost double from 361,000 in year 2000 to some 700,000 by 2020, the implementation and initial ramp-up period for the proposed high-speed rail system.

As shown in Figure 1, while ridership (and revenue) would initially be higher when using the I-5 Grapevine alignment, this relationship would change rather quickly in favor of the Antelope Valley option as population and employment in that region surge at several times the rate of more established urban centers.

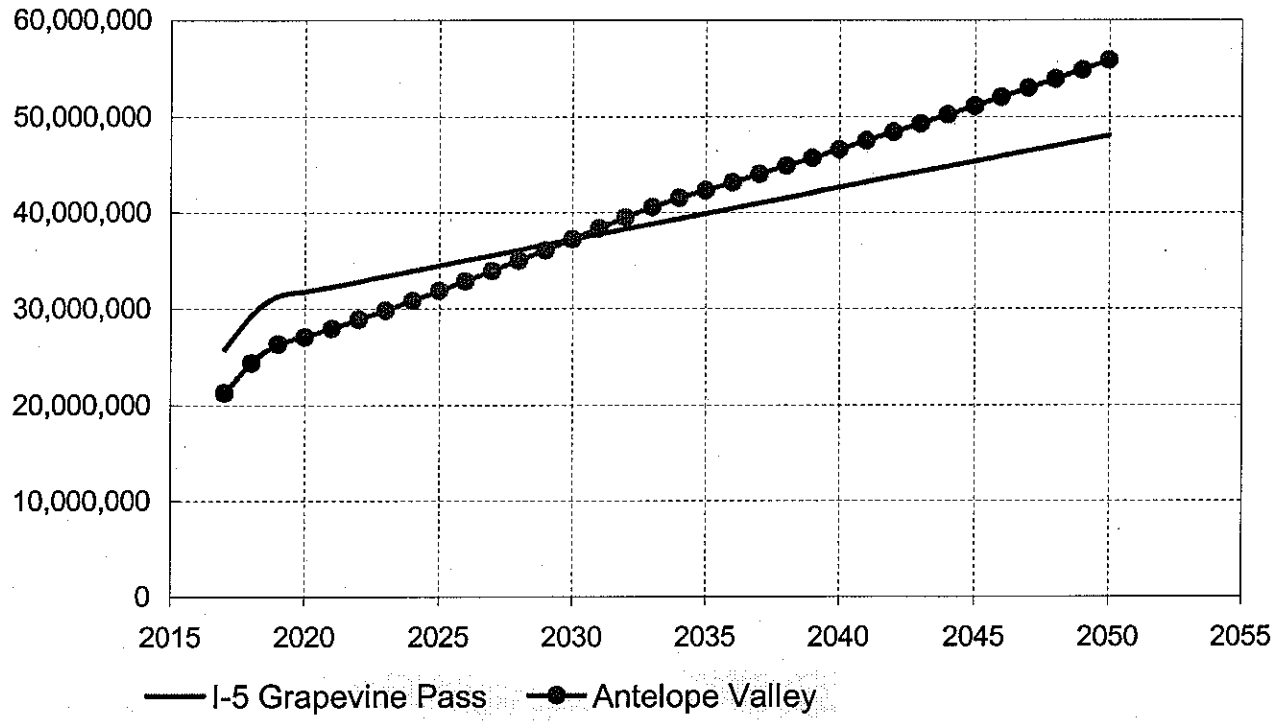
Economic Integration

As used in this report, "economic integration" is the extent to which a new investment (such as the high-speed rail system) will connect with, complement, and support other transportation modes and the businesses they serve, thereby maximizing the multiplicative economic effects of these resources. It is through such network effects that transportation infrastructure in general can maximize its contribution to economic efficiency and high living standards in regional economies.

Due principally to the added accessibility afforded by the Antelope Valley over the I-5 Grapevine option, the former provides far stronger intermodal connectivity and support for industrial "agglomeration." Trackage through the Antelope Valley will provide two kinds of modal connectivity, namely: an inter-modal connection for air travelers using the Palmdale Regional Airport, and a modal choice for long-distance auto users in the Antelope Valley growth corridor.

[3] National Cooperative Highway Research Program Report 431, *Valuation of Travel Time Savings and Predictability in Congested Conditions.*

Figure 1: Annual Intercity Ridership Projections, By Alignment Alternative



Agglomeration is a term for the economies of scale that arise in regional economies, creating wealth and improved standards of living wherever they occur. The Antelope Valley alignment would foster economies of scale within and between existing industry (e.g., the aerospace sector) and other Antelope Valley growth sectors, while the I-5 Grapevine alignment, a wilderness route with no planned stations, would have no similar effect. The estimated value of agglomeration economies associated with the Antelope Valley alignment is $540-818 million over the initial 33-year project life-cycle.

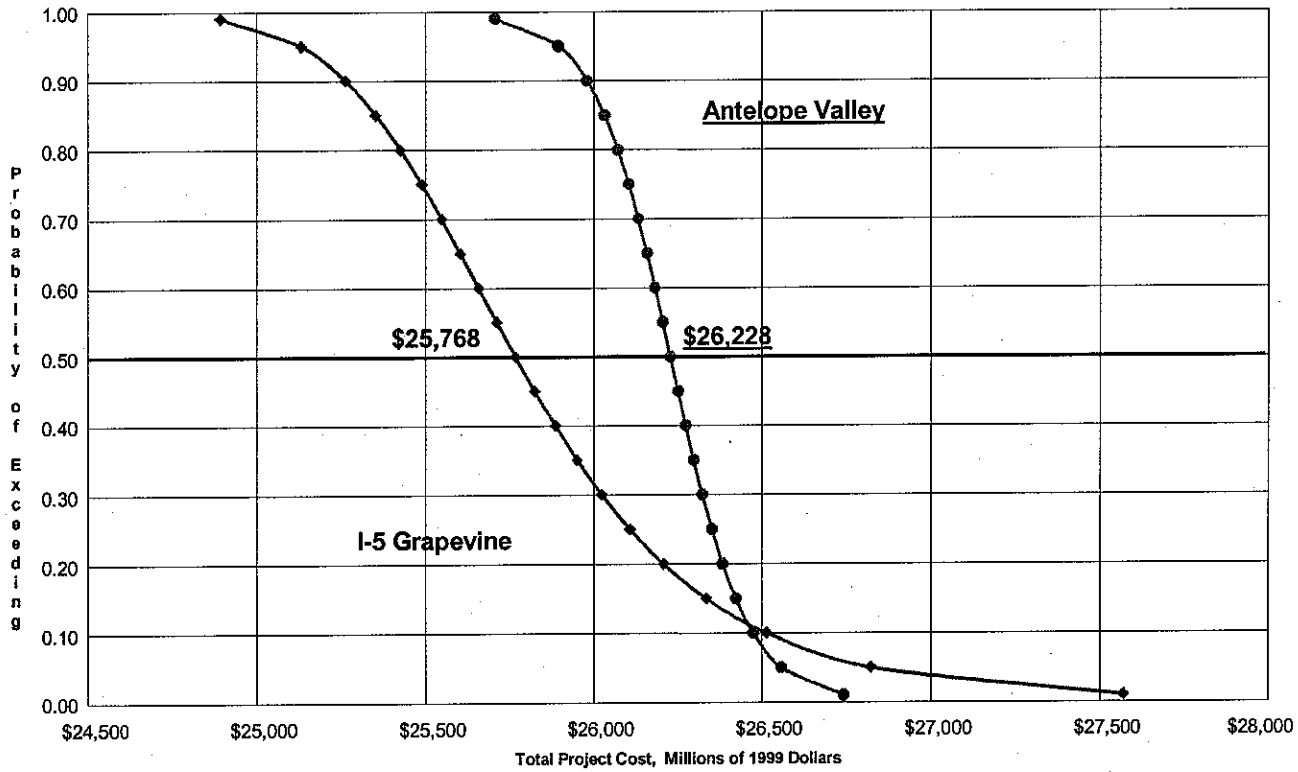
Construction Cost and Schedule Risk

Apart from general ridership and revenue risk, the principal business risks facing the California High-Speed Rail Authority pertain to construction period capital outlay and project schedule. Risk analysis of the engineering factors that underlie the choice between the Antelope Valley and the I-5 Grapevine alignment options suggest that both risks are minimized under the Antelope Valley choice.

The risk analysis of capital expenditure revolves principally around the uncertainty associated with achieving optimal tunnel gradients through Tehapachi Mountains under the I-5 Grapevine option. Whereas 3.5 percent grades would minimize tunneling costs, current high-speed train technology tends to perform optimally at no more than three percent gradients, with 2.5 percent preferred. As shown in Figure 2, if engineering "planning assumptions" are achieved, there is a 50 percent probability that the I-5 Grapevine Pass option could generate capital costs that lie 1.8 percent below the expenditure required under the Antelope Valley alternative. The sizeable excavation and tunneling risks also mean, however, that the I-5 Grapevine option could become as much as $1.4 billion more expensive than the Antelope Valley alternative.

Excavation and tunneling also bring schedule risk. Unexpected or unplanned additions to earthwork, sub-grade construction and tunneling are the principal causes of slippage against project schedules. The I-5 Grapevine option thus presents a substantially greater risk of project schedule delay than does the Antelope Valley alternative.

Figure 2: Capital Cost Risk, Antelope Valley vs. I-5 Grapevine



Overall Economic Viability (Benefit/Cost Analysis)

The Antelope Valley option offers greater promise of economic benefits that will exceed the costs of achieving them. As accurately described by the Authority's ridership and revenue consultant, the benefits of high-speed rail would occur in the form of travel time savings and vehicle operating cost savings for rail passengers and for remaining highway and aviation users; reduced loss of life, injuries, and property damage in highway accidents; and diminished volumes of air pollutants and greenhouse gases. Over its first 33 years of operation, a high-speed rail system employing the I-5 Grapevine alignment has been estimated to generate as much as $22.7 billion in benefits over and above the costs of achieving them (present value of constant 1999 dollars). We estimate that the Antelope Valley alignment would generate an additional $855 million in net benefits (above that expected under the I-5 Grapevine alternative) Additional details can be found in Table 1, below.

It is noteworthy that the Antelope Valley alignment offers greater economic returns to the state of California in spite of the possibility that the I-5 Grapevine alternative could generate about 3.6 percent lower capital and operating costs. As discussed below, lower capital costs under the I-5 Grapevine option would occur only if the savings associated with building 33-37 fewer route miles offset the expense of up to 13 extra miles of tunneling. While considerable uncertainty attaches to the true nature of this trade-off, the Antelope Valley would nevertheless generate stronger economic returns under even the most optimistic assumptions regarding the cost of tunneling across the I-5 Grapevine.

Table 1: Comparative Evaluation of Alternative Alignments, Summary

(All Figures in Millions)

	Antelope Valley	I-5 Grapevine	Difference
Passenger Revenue (1)	$9,686	$9,651	$35
User Benefits			
Intercity	$8,464	$8,519	-$55
Urban (2)	$350	$317	$33
Subtotal User Benefits	$8,814	$8,835	-$21
Nonuser Benefits			
To Intercity Travelers (3)			
Airline Passenger Delay	$8,028	$7,765	$263
Aircraft Operating Delay	$4,407	$4,283	$125
Highway Delay	$3,760	$3,540	$219
Highway Accident Cost	$779	$780	-$1
Highway Air Pollution	$103	$103	$0
Subtotal	$17,077	$16,471	$607
To Urban Travelers (4)			
Highway Delay	$9,817	$8,822	$995
Highway Accident Cost	$360	$326	$34
Highway Air Pollution	$48	$43	$4
Subtotal	$10,225	$9,192	$1,034
Subtotal Nonuser Benefits	$27,303	$25,662	$1,640
Total Benefits	$45,802	$44,149	$1,654
Costs			
Capital	-$15,928	-$15,443	-$485
Operating and Maintenance	-$6,329	-$6,015	-$314
Total Costs (5)	-$22,257	-$21,458	-$799
Net Benefits (Present Value)	**$23,545**	**$22,690**	**$855**
80% Confidence Interval			
Lower Bound	$ 20,948	$ 21,245	$ (297)
Upper Bound	$ 26,373	$ 23,530	$ 2,844

(1) Does not include revenue from express commuter services

(2) Benefits to HSR express commuters

(3) From diversion of intercity travelers to HSR

(4) From diversion of intercity travelers AND commuters to HSR

(5) Does not include cost of providing express commuter services

Daily News

DAILY NEWS / THURSDAY, MARCH 11, 2004 / NEWS — 15

Driving progress through town on a rail

By Michael D. Antonovich

RECENTLY, the California High Speed Rail Authority released a report concluding that a high-speed rail project is the best way to meet the transportation needs of Californians in the decades to come.

Although many focused on the difficult question of how to pay for this mammoth project, Southern Californians should be aware that much of our region's transportation future hangs on the route that's chosen to serve the Southland.

The Rail Authority's draft environmental impact report envisions a bullet train that would carry passengers from San Francisco to Los Angeles in about 2½ hours. It would also provide much-needed transportation through the Central Valley, and eventually connect with other key cities such as Sacramento and San Diego.

Although large public investment is needed to meet the state's growing transportation needs, high-speed rail is the least expensive and safest of the viable options. The report points out that our population is expected to increase more than 30 percent by 2020, and demand for intercity travel rising by twice that rate, the state must make transportation improvements.

Without a modern rail system, the DEIR forecasts the state would have to invest $82 billion in highways and airport expansion to keep up with demand. Even then, traffic conditions on the highways are expected to worsen. High-speed rail would not only be half the cost ($37 billion), but it would also save energy, reduce air emissions, reduce impacts from construction, increase economic growth and discourage urban sprawl.

Many questions remain unanswered. The first is how the cash-strapped state will pay for the project. Even as the lowest-cost viable alternative the high-speed rail's $37 billion price tag will require state, local and federal support. A $10 billion bond measure originally slated for November will likely be put off until 2006 at the earliest.

Perhaps the single most pressing issue for Southern Californians is which route will connect Bakersfield to Los Angeles. Two routes are currently being proposed: one following the I-5 through the Grapevine, and the other heading southeast through the Antelope Valley in North Los Angles County. The Antelope Valley, one of the fastest growing areas in California and a last bastion of affordable housing in the county, is the most logical choice. Compare this to the virtually unpopulated and mountainous route through the Grapevine. Nonetheless, the Grapevine is still being considered because it shaves (at most) 10 to 12 minutes off the total travel time from San Francisco to Los Angeles.

Surely, most Southern Californians would agree that the benefits of the Antelope Valley route far outweigh the minimal time savings of a trip through the comparatively desolate Grapevine.

The Antelope Valley route would help relieve commuter congestion on the I-5 and State Route 14, as Antelope Valley residents could be shuttled to downtown in only 26 minutes on the rail — much faster than the freeways. This would help free up the roadways for other L.A. commuters. It would also link important business centers in the Antelope Valley to help spur economic development and job growth, and connect Palmdale Regional Airport to Los Angeles to help relieve congestion at other Southland airports.

In stark contrast, the Grapevine route would link no major business or population centers, involve more tunneling and significantly higher construction risk, generate less ridership revenues, cross dangerous earthquake faults, potentially threaten parkland and do virtually nothing to alleviate our region's mounting traffic problems.

The California High Speed Rail Authority has said it won't pick preferred routes until its environmental reviews are finalized following a series of public hearings. The hearing in Los Angeles is scheduled for April 13. It is important that Southern Californians make their voices heard.

Michael D. Antonovich is a Los Angeles County Supervisor.

Opinion

Antelope Valley Press, Tuesday, March 30, 2004

MTA's backing of AV rail route carries clout

Editorial

FOCUS: The Metropolitan Transportation Authority's backing of the Antelope Valley routing for the state's proposed high-speed rail is of paramount importance to our region and to the state as a whole.

By the time California's proposed high-speed rail line is operational, the Antelope Valley may be home to well over 1 million residents.

Gorman, on the other hand, may have just a few thousand.

Those facts were extremely important in the March 25 decision by the Metropolitan Transportation Authority to support the route through Lancaster and Palmdale, as opposed to the alignment under consideration in the vicinity of Interstate 5.

The debate relating to the alternate routes has been going on for nearly a decade. The cost would be about the same for either route, but the alignment running roughly parallel to the Golden State Freeway would be shorter and would shave a few minutes from travel time for those taking the ride between San Francisco and Los Angeles.

But the astounding growth of the Antelope Valley — where many commuters now use the Metrolink — underscores the need for high-speed rail to connect with both Los Angeles and points north, including San Francisco.

The California High-Speed Rail Authority, which is nearing completion on a plan for a $37-billion electric-powered bullet train, hopes to provide service between downtown San Francisco and Los Angeles Union Station in just 2 hours and 25 minutes.

In the past, that time element might have seemed noncompetitive with airline service, but in the post-9-11 era, rail passengers could save a lot of time. The congestion in the vicinity of Los Angeles International Airport and the slow-motion security procedures have dramatically extended air travel time.

A Lancaster resident might have to travel for as many as five hours to get to San Francisco International Airport, plus another hour or so to get to downtown.

Antelope Valley leaders have appeared at numerous hearings to press for the local routing of the high-speed rail, but the decision has not yet been finalized. The backing of the powerful MTA for the AV route is extremely important and should carry huge clout with the California High-Speed Rail Authority.

A $120-billion bond measure allowing construction to begin on the project is set to be placed on the November ballot.

However, because of the current budget crisis, legislators and Gov. Arnold Schwarzenegger are working to delay the measure until 2006.

Rome was not built in a day, and the California high-speed rail project will not be operational for many years, but it is an important program that must be pursued to counter the mounting freeway congestion that plagues our state.

Opinion

Antelope Valley Press, Sunday, March 28, 2004

Bullet train satisfies California's needs

Commentary
Michael D. Antonovich

Recently the California High Speed Rail Authority released a report concluding that a high-speed rail project is the best way to meet the transportation needs of Californians in the decades to come.

Although many observers focused on the difficult question of how to pay for this mammoth project, Southern Californians should be aware that much of our region's transportation future hangs on the route that's chosen to serve the Southland.

As it's described by the CHSRA's draft environmental-impact report, the ambitious project envisions a bullet train that would carry passengers from San Francisco to Los Angeles in about 2½ hours. It would also provide much-needed transportation through the central valley, and eventually connect with other key cities such as Sacramento and San Diego.

Although large public investment is needed to meet the state's growing transportation needs, high-speed rail is the least expensive and safest of the viable options. The report points out that our population is expected to increase over 30% by 2020, with demand for inter-city travel rising by twice that rate.

The state must make transportation improvements. Doing nothing is not an option. If infrastructure doesn't keep pace, it will have disastrous consequences for the state's travelers.

The report predicts demand for travel between Bakersfield and L.A. will increase 70% by 2020, and if nothing is done, a trip on the I-5 that previously took two hours would take twice as long.

Without a modern rail system, the environmental-impact report forecasts the state will have to invest $82 billion in highways and airport expansion to keep up with demand. Even then, traffic conditions on the highways are expected to worsen.

High-speed rail would not only be half the cost ($37 billion), it would save energy, reduce air emissions, reduce impacts from construction, increase economic growth and discourage urban sprawl.

Clearly, the high-speed rail project offers solutions other non-rail alternatives do not, but many questions remain unanswered.

The first is how the cash-strapped state will pay for the project. Even as the lowest-cost viable alternative, the high-speed rail's $37 billion price tag will require state, local and federal support. A $10 billion bond measure originally slated for November will likely be put off until 2006 at the earliest.

An equally important question for Californians is whether the proposed rail routes will serve growing population and business centers. A variety of proposed routes are being considered, but not all routes are equal.

The biggest issue for Southern Californians is which route will connect Bakersfield to Los Angeles. Two routes are currently being proposed: one follows the I-5 through the Grapevine, and the other heads southeast through the Antelope Valley.

The Antelope Valley, one of the fastest growing areas in California and a last bastion of affordable housing in the county, is the most logical choice. Compare this to the virtually unpopulated and mountainous route through the Grapevine.

Nonetheless, the Grapevine is still being considered because it shaves (at most) 10 to 12 minutes off the travel time from San Francisco to Los Angeles.

Surely most Southern Californians would agree that the benefits of the Antelope Valley route far outweigh the minimal time savings of a trip through the comparatively desolate Grapevine.

In 2020, the population of the Antelope Valley will have almost tripled to at least 1 million — and many will commute to Los Angeles on congested highways.

The Antelope Valley route would help relieve commuter congestion on the I-5 and SR 14, as Antelope Valley residents could be shuttled to downtown in only 26 minutes on the rail — much faster than the freeways. This would help free up the roadways for other commuters.

It would also link important business centers in the Antelope Valley to help spur economic development and job growth, and connect Palmdale Regional Airport to Los Angeles to help relieve congestion at other Southland airports.

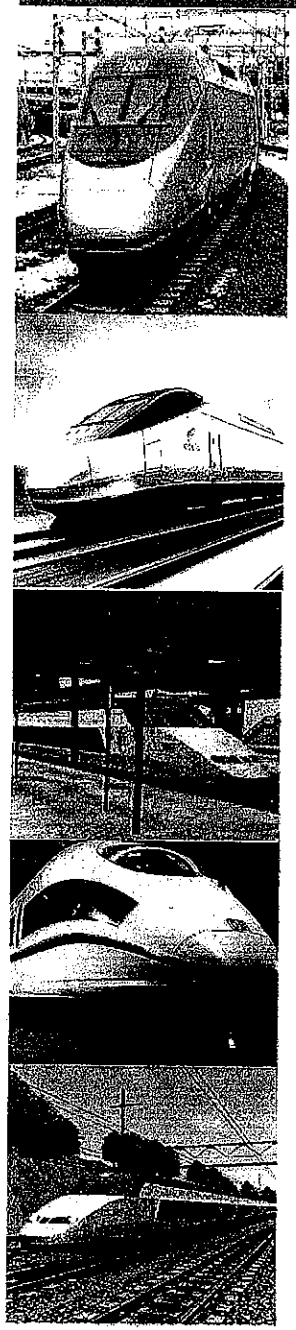
In stark contrast, the Grapevine route would link no major business or population centers, involve more tunneling and significantly higher construction risk, generate less ridership revenues, cross dangerous earthquake faults, potentially threaten parkland, and do virtually nothing to alleviate our region's mounting traffic problems.

That's why the Antelope Valley route is supported by a growing list of more than 50 civic and private endorsers, including the City and County of Los Angeles.

The California High Speed Rail Authority has said it won't pick preferred routes until its environmental reviews are finalized following a series of public hearings. The hearing in Los Angeles is scheduled for April 13. It is important that Southern Californians make their voices heard. We should all support high-speed rail, but only if our investment goes to support the transportation needs of the state's most populous region.

Antonovich is Fifth District supervisor of Los Angeles County.

THE ANTELOPE VALLEY ALIGNMENT



California Supports the AV Route

- Antelope Valley Board of Trade
- Antelope Valley Regional Partnership
- Bakersfield Chamber of Commerce
- Board of Supervisors Los Angeles County
- Congressman Bill Thomas
- Congressman Buck McKeon
- Congressman Calvin Dooley
- California City Economic Development Corporation
- City of Arvin
- City of Bakersfield
- City of Chowchilla
- City of Clovis
- City of Delano
- City of Fresno
- City of Kerman
- City of Lancaster
- City of Los Angeles
- City of Madera
- City of Merced
- City of Palmdale
- City of Sanger
- City of Taft
- City of Tehachapi
- City of Visalia
- City of Wasco
- County of Fresno
- County of Kern
- County of Kings
- County of Los Angeles
- County of Madera
- County of Tulare
- County of Stanislaus
- Fresno Chamber of Commerce
- Kern Council of Governments
- Kern Economic Development Corporation
- Kern Transportation Foundation
- LAWA (Los Angeles World Airports)
- Lemoore Chamber of Commerce
- Lindsay Chamber of Commerce
- Los Angeles County Metropolitan Transportation Authority
- Madera County Transportation Commission
- Mayor of Los Angeles
- Merced Chamber of Commerce
- Mike Antonovich, Supervisor
- North County Transportation Coalition
- Palmdale Association of Realtors
- Palmdale Chamber of Commerce
- San Joaquin County Council of Governments
- San Joaquin Valley Supervisors Association
- Southern California Association of Governments
- Stanislaus Area Association of Governments
- Steering Committee of Caltrans Rail Task Force
- Taft Chamber of Commerce

The Best Choice for California.

Congress of the United States

Washington, DC 20515

June 23, 2003

Mehdi Morshed
Executive Director
High Speed Rail Commission
State of California
925 L Street, Suite 1425
Sacramento, CA 95814

Dear Mr. Morshed:

As Members of Congress representing California's Central Valley and high desert communities, we have a deep interest and concern for those matters that have significant community, fiscal, environmental, and federal funding implications. It is from that vantage point that we jointly wish to express our concerns and expectations for the evaluation and decision process that is being carried out to select the route of the high speed rail system, and specifically, that portion of the route connecting Bakersfield with the San Fernando Valley.

We understand that there are two possible alignments for the segment between Bakersfield and the San Fernando Valley. One option would follow state highway 58 over the Tehachapi mountains through Palmdale and Lancaster into the San Fernando Valley at Sylmar. The other option would essentially follow Interstate Highway 5 through the Tehachapi Mountains and through the Santa Clarita Valley, also connecting in the San Fernando Valley at Sylmar. While a significant population center in the Santa Clarita Valley will be by-passed for technical reasons no matter which of the two alignments is ultimately selected, we believe that the I-5 alignment will specifically disenfranchise the significant and growing population and economic center identified presently by the communities of Palmdale and Lancaster. This is of serious concern to us.

Public policy arguments founded in common-sense growth principles certainly favor the Route 58 alignment. The I-5 alignment will cause the first station north of Los Angeles to be in Bakersfield, while the Route 58 alignment through Lancaster and Palmdale will result in the first station north of the Los Angeles basin to be there. Significant public infrastructure already exists there, and the Antelope Valley is indeed the ideal location to accommodate the continuing growth of Los Angeles County.

We are hopeful that your board will very carefully consider the will of these communities of interest in its final decision. We intend to follow this matter carefully throughout your decision process and the federal authorization, which we understand will be required to fund the rail system's construction. We request that we be kept informed of the process and progress your decision path is taking.

The envisioned high speed rail system has great potential for California. It will influence long-term growth and development of the state. In fifty more years, the California we know will either benefit from, or be the victim of, our decisions today. We strongly believe the high desert area of northern Los Angeles and San Bernardino Counties stands as a compelling location for orderly development, sparing the possible accelerated demands to convert farmland in the central valley. A connection to the high speed rail system will ensure we do not disenfranchise these Antelope Valley communities, and it will help ensure the southern San Joaquin Valley does not become just the next bedroom community of Los Angeles.

Sincerely,

CAL DOOLEY
Member of Congress

WILLIAM THOMAS
Member of Congress

HOWARD P. "BUCK" McKEON
25TH DISTRICT, CALIFORNIA

COMMITTEE ON ARMED SERVICES
SUBCOMMITTEE ON TACTICAL AIR AND LAND
SUBCOMMITTEE ON MILITARY READINESS

COMMITTEE ON EDUCATION AND THE WORKFORCE
CHAIRMAN
SUBCOMMITTEE ON 21ST CENTURY COMPETITIVENESS
SUBCOMMITTEE ON EMPLOYER-EMPLOYEE RELATIONS

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ANTELOPE VALLEY OFFICE
1008 WEST AVENUE M–14, SUITE E–1
PALMDALE, CA 93551
(661) 274–9688

SAN BERNARDINO, INYO,
AND MONO COUNTIES
(800) 565–4333

August 15, 2003

Mehdi Morshed
Executive Director
High Speed Rail Commission
State of California
925 L Street, Suite 1425
Sacramento. CA 95814

Dear Mr. Morshed:

As one of the Congressman representing the Antelope Valley Community, I have a deep interest and concern for those matters that have significant community, fiscal, environmental and federal funding implications. For that reason, I wish to express my concerns and expectations for the evaluation and decision processes in selecting the route for the high-speed rail system, and specifically, the portion connecting Bakersfield with the San Fernando Valley.

I understand that two possible alignments have been proposed for the segment between Bakersfield and the San Fernando Valley. The first option would follow State Highway 58 over the Tehachapi Mountains through Palmdale and Lancaster into the San Fernando Valley at Sylmar. The other option would essentially follow Interstate Highway 5 through the Tehachapi Mountains and through the Santa Clarita Valley, also connecting in the San Fernando Valley at Sylmar. While a significant population center in the Santa Clarita Valley will be by-passed for technical reasons no matter which of the two alignments is ultimately selected, I believe that the I-5 alignment will specifically disenfranchise the significant and growing population and economic center identified presently by the communities of Palmdale and Lancaster.

Public policy arguments founded in common-sense growth principles certainly favor the Route 58 alignment. The I-5 alignment will cause the first station north of Los Angeles to be in Bakersfield, while the Route 58 alignment through Lancaster and Palmdale will result in the first station north of Los Angeles to be there. Significant public infrastructure already exists and the Antelope Valley is indeed the ideal location to accommodate the continuing growth of Los Angeles County.

The envisioned high-speed rail system has great potential for California. It will influence long-term growth and development of the state. In fifty more years, the

California we know will either benefit from, or be the victim of, our decisions today. I strongly believe the high desert area of northern Los Angeles and San Bernardino Counties stands as a compelling location for orderly development, sparing the possible accelerated demands to convert farmland in the central valley. A connection to the high-speed rail system will ensure that we do not disenfranchise these Antelope Valley communities, and it will help ensure the southern San Joaquin Valley does not become just the next bedroom community of Los Angeles.

I am hopeful that your board will very carefully consider the will of these communities of interest in its final decision. I intend to follow this matter carefully throughout your decision process and the federal authorization, which we understand will be required to fund the rail system's construction. Please keep me informed of the process and progress of your final decision. Should you have any questions, please feel free to contact Kurt Courtney of my staff at (202) 225-1956.

Sincerely,

Howard P. "Buck" McKeon
Member of Congress

HPM: kmc